

SAFETY ADVISORY

Odor Fade in Natural Gas and Propane

RECOMMENDATIONS

The NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) recommends that fire departments ensure all firefighters responding to natural gas or propane incidents:

- ❑ use gas detection equipment and do not rely upon their sense of smell to determine if propane or natural gas is present
- ❑ understand that the odorant in natural gas or propane can fade
- ❑ are trained on the proper calibration, maintenance, and use of gas detection equipment to determine if a potential explosive atmosphere is present
- ❑ recognize that the lack of odor can result from the natural gas or propane contacting soil, concrete, and a wide variety of building materials such as drywall, wood, and new piping storage tanks



Propane tank involved in the explosion described in the FFFIPP Investigation
Photo courtesy of Maine Fire Marshal

FFFIPP INVESTIGATION

On September 16, 2019, a fire department responded to a propane leak at a newly renovated office building. Several firefighters entered the building. The propane gas ignited and caused an explosion. The blast resulted in a line of duty death of a firefighter and the hospitalization of six other firefighters. The NIOSH FFFIPP investigated this incident and identified the odor fade of mercaptan as a key contributing factor. During this investigation, NIOSH FFFIPP investigators learned that some fire departments may not fully understand odor fade. They also may not recognize the subsequent explosion hazard that exists when responding to natural gas and propane incidents where there is not enough odorant in the released material to alert firefighters to its presence.

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QUESTIONS & ANSWERS

What is an odorant?

Odorant is a volatile liquid that is added to natural gas and propane prior to distribution in pipelines as a safety precaution to make it smell. It helps detect a gas leak because natural gas and propane are odorless. The two most common odorants are methyl mercaptan (for natural gas) and ethyl mercaptan (for propane and n-butane).

What is mercaptan?

Mercaptan is a sulfur-containing compound added to natural gas, n-butane, and propane to give it a distinct odor. The odor is described as smelling like a rotten egg or rotten cabbage.

Are there medical conditions that affect sense of smell?

Anosmia (inability to smell), hyposomia (reduced sense of smell), and nasal inflammation can interfere with the ability to smell mercaptan odorant.

How does odorant such as mercaptan fade?

The odor of mercaptan may fade by absorption or oxidation when leaking natural gas or propane from underground lines passes through soil and concrete. Materials such as drywall and plywood may also cause odor fade. New piping for natural gas or storage tanks for propane can remove the odorant through adsorption of the odorant into the interior of the pipes or tank shell.

Is odor fade more common in certain types of gas installations?

Odor fade is generally most common in new large diameter steel pipes and storage tanks. However, odor fade can also occur in smaller diameter gas lines made of polyethylene.

What can be done to ensure odor does not fade?

For new natural gas or propane installations, many gas installation companies perform pipeline conditioning to saturate the new gas installations prior to use. Likewise, new storage tanks and new components of natural gas or propane installations should be conditioned prior to use.

Are there ways to detect a natural gas or propane leak when there is no odor?

Underwriters Laboratories (UL) and gas suppliers recommend personnel use gas detection equipment to detect natural gas or propane leaks.



Debris field from the propane explosion described in the FFFIPP Investigation

Photo courtesy of Maine Fire Marshal

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